IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. of:	Bushey, B. et al.	)	PATENT
Serial No.:	10/693,525	)	Art Unit: 2834
Filed:	October 23, 2003	)	Examiner: MASIH, K.
For:	LINEAR ACTUATOR CONTROL STRUCTURE	)	Atty. Docket: 24,954-09RE

AMENDMENT

MAIL STOP AMENDMENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action mailed June 15, 2007 Applicant submits the following amendments to the claims and remarks.

Amendments to the claims are reflected in the listing of the claims which begins on page 2 of this paper.

Remarks / Arguments begin on page 8 of this paper.

Amendments to the Claims:

1. (original) A control system for a linear actuator having an associated current level, said control system comprising:

a current control component for controlling a current flow to the linear actuator, said current control component responsive to an input control signal;

a current sensing component for determining an operation current level of the linear actuator and generating a current signal as a function of the operational current level of the linear actuator;

a control device for generating a drive signal and a force request signal;

a load signal generating device responsive to the force request signal and the current signal; and

a control device for controlling the current control component, said control device accepting a load signal and the drive signal and generating the input control signal to control the current control component.

2. (original) A control system for a linear actuator according to claim 1, wherein the current control component is a switch device for operatively coupling the linear actuator to a circuit ground.

3. (original) A control system for a linear actuator according to claim 2, wherein the switch device includes a FET switch.

4. (original) A control system for a linear actuator according to claim 1, wherein the linear actuator current signal detection component includes a shunt resistor structure.

5. (original) A control system for a linear actuator according to claim 1, wherein the force request signal is a digital signal.

6. (original) A control system for a linear actuator according to claim 1, wherein the force request signal operation component includes a digital-to-analog converter.

7. (original) A control system for a linear actuator according to claim 1, wherein the load signal generating device is a comparator for comparing the force request signal and the current signal.

8. (original) A linear actuator control system comprising:

a linear actuator having a predetermined current level;

a current level detection device operatively coupled to the linear actuator and generating a current level signal;

a digital control device generating a first control signal and a second control signal, said digital control device receiving a feedback signal;

a comparator device for receiving the first control signal and the current level signal, said comparator device generating a comparison signal; and

a control device accepting the comparison signal and the second control signal and controlling the current level of the linear actuator.

9. (original) A linear actuator control system according to claim 8, wherein the control device includes a FET switch.

10. (original) A linear actuator control system according to claim 8, wherein the control device includes a NAND logic device.

11. (original) A linear actuator control system according to claim 8, wherein the current level detection device includes a shunt resistor structure.

12. (original) A linear actuator control system according to claim 8, wherein the first and second control signals are digital signals.

13. (previously presented) A linear actuator control system according to claim 8, wherein the first control signal is processed by a D/A converter prior to being introduced to the comparator device.

14. (previously presented) A control system for a linear actuator device comprising:

a linear actuator including an electric motor having a current level;

an electronic controller generating a pair of signals, each signal representative of a desired delivery of current to the linear actuator;

a motor current sensing device for determining the current level of the linear actuator electric motor, said device generating a current signal;

a comparator for comparing the current signal to one of the pair of signals, said comparator generating a comparator signal upon the current signal exceeding a current level associated with the one of the pair of signals; and

a logic device receiving the comparator signal and the other of the pair of signals, said logic device controlling the flow of current to the electric motor of the actuator.

15. (original) A control system according to claim 14, wherein the logic device is a NAND device and wherein an output of the NAND device is coupled to a current switch.

16. (original) A control system according to claim 15, wherein the current switch is a FET switch.

17. (original) A control system according to claim 14, wherein the electronic controller operates at a predetermined system speed, and wherein the pair of signals are generated and held through a predetermined time interval dependent upon the system speed.

18. (original) A control system of claim 17, wherein the motor current sensing device, the first comparator, and the logic device function to control a current flow to the electric motor within a time interval which is substantially smaller than the predetermined time interval of the electronic controller.

19. (original) A control system for a linear actuator comprising:

a linear actuator having an electric motor, said electric motor drawing a variable current level during operation;

a current level sensor for determining an operational current level of the linear actuator;

a controller for generating a drive signal, said drive signal remaining constant during a predetermined time interval, said controller further generating a force request signal representative of a desired current level of the linear actuator; and

a current limiting component for receiving the force request signal, the current level of the linear actuator and the drive signal, said current limiting component minimizing the current level of the electric motor in response to a comparison between the force request signal and the desired current level, said current limiting component minimizing the current level within a time interval substantially smaller than the predetermined time interval.

20. (original) A control system according to claim 19, wherein the current limiting component includes a comparator and a logic device.

21. (original) A control system according to claim 20, wherein the drive signal includes a digital signal and the force signal includes an analog signal.

22. (previously presented) A control system for an electric actuator comprising:

a electric actuator having an electric motor, said electric motor drawing a variable current level during operation;

a current level sensor for measuring an operational current level of the electric actuator;

a electronic controller for generating a force request signal representative of a desired current level of the electric actuator; and

a current limiting component for receiving the force request signal and the current level of the electric actuator, said current limiting component minimizing the current level of the electric motor in response to a comparison between the force request signal and the current level of the electric actuator.

23. (previously presented) The control system of claim 22, wherein the current level sensor includes a shunt resistor structure.

24. (previously presented) The control system of claim 22, wherein the force request signal includes at least a high current signal and a low current signal.

25. (previously presented) The control system of claim 22, wherein the current limiting component includes a comparator receiving the force request signal and the current level of the electric actuator.

26. (previously presented) The control system of claim 22, wherein the current limiting component includes a FET switch.

27. (previously presented) A control system for an electric actuator device comprising:

a electric actuator including an electric motor having a current level;

a electronic controller generating a signal representative of a desired delivery of current to the electric actuator;

a motor current sensing device for measuring the current level of the electric actuator and generating a current signal;

a comparator for comparing the current signal to the signal representative of the desired delivery of current to the electric actuator, said comparator generating a comparator signal upon the current signal exceeding a current level associated with the signal representative of the desired delivery of current to the electric motor; and

a logic device receiving the comparator signal, said logic device controlling the flow of current to the electric motor of the actuator.

28. (previously presented) The control system of claim 27, wherein the logic device includes a NAND device.

29. (currently amended) An electric actuator control system <u>for a surface maintenance machine</u> comprising:

a electric actuator drawing a variable current level during operation<u>, said actuator moving a portion of the surface maintenance machine toward contact with a floor surface</u>;

a current level detection component operatively coupled to the electric actuator and generating a current level signal;

a digital control component generating a first control signal;

a comparator device for receiving the first control signal and the current level signal, said comparator device generating a comparison signal; and

a control component utilizing the comparison signal to control the current level of the linear actuator, said control component limiting a force applied to the floor surface by said portion while said surface maintenance machine is powered across the floor surface.

30. (previously presented) The control system of claim 29, wherein the control component includes a FET switch.

31. (currently amended) A method of controlling an electric actuator of a surface maintenance machine comprising:

providing a linear actuator on a surface maintenance machine, said linear actuator drawing a variable current level during operation, and said linear actuator being coupled to a portion of the surface maintenance machine, said portion adapted to move toward contact with a floor surface in response to activation of said linear actuator;

measuring a current level of the linear actuator during operation;

generating a current level signal;

generating a first control signal;

comparing the first control signal and the ~~measured~~ current level signal;

generating a comparison signal based on the step of comparing; and

controlling the current level of the electric actuator based on the comparison signal, said controlling tending to limit a down force applied by said portion against the floor surface while said surface maintenance machine is powered across the floor surface.

Remarks

Claims 1 - 31 remain pending in this application.

Claims 1 – 28 have been indicated as allowed.

Claims 29 – 31 were previously rejected.

Claim Rejections – 35 U.S.C. § 103

Claims 29-31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lange et al in view of Baba. It is respectfully submitted that the combination of Lange et al and Baba is not proper as the combination fails to yield every limitation of the claims. For example, neither Lange et al nor Baba disclose or suggest a floor surface maintenance machine which is powered across the floor surface during operation, nor a linear actuator which moves a portion of the surface maintenance machine toward the floor surface while the machine is powered across the floor surface.

Reconsideration of this rejection is respectfully requested.

CONCLUSION

Applicant respectfully requests that the Examiner reconsider the pending claims.

Please direct any questions regarding this application to John Klos at (612) 321-2806.

Dated: September 13, 2007

Respectfully submitted,
Tennant Company, by its attorneys

By: _____

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